

The Significance of the Discovery at Piltdown

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Although the dust raised by the "hurly-burly" which followed the famous discovery at Piltdown is only in process of settling, the air is now clear enough to foretell with some degree of certainty how the issues of the day are to go. Mr. Charles Dawson and Dr. Smith Woodward brought *Eoanthropus Dawsoni* before the scientific public at a crowded meeting of the Geological Society on December 18th, 1912. Three months before then I had been accorded, in these pages,¹ the privilege of giving a brief account of "Recent Discoveries of Ancient Man," and of dealing with the bearing of those discoveries on our present knowledge of man's origin and evolution. A review of the conclusions reached in that paper will serve to show how far the discovery at Piltdown has obliged us to modify our conception of man's origin and antiquity. One of the conclusions reached in that paper related to the position of Neanderthal man in our ancestral tree, namely, that he was not, as is so often believed, the Pleistocene ancestor of modern man, but represented a totally distinct branch or species of humanity, one which became extinct in Europe some time before the end of the Pleistocene period – the geological epoch which precedes the present.

If we accept the estimate of Professor Sollas that the Pleistocene period must have lasted at least 400,000 years, then we may, by way of a provisional estimate, regard Neanderthal man as having become extinct somewhere about 50,000 years ago – probably more. The conception of Neanderthal man as a distinct human species of man, marked by certain anthropoid features, was clearly enunciated by Professor William King, 2 of Queen's College, Galway, at the beginning of 1864; he named the species *Homo Neanderthalensis*. In the same year Huxley 3 carried the day against King, and hence, until the beginning of the present century, most of us regarded Neanderthal man as a primitive ancestral form of modern man manifesting particular affinities with Australian aborigines. Then with the present century appeared the investigations of Professor Schwalbe, Dr. Adloff, M. Rutot, Professor Sergi and Dr. G. Kramberger, with the result that King's conception began to replace that of Huxley. With the appearance, in 1913, of Professor Boule's elaborate monograph on the remains of Neanderthal man found at La Chapelle, within the watershed of the Dordogne, France, and the conversion of its author to the more reasonable view, we may regard the position of Neanderthal man as finally fixed. The discovery at Piltdown does not alter such a conclusion; it simply confirms us in believing that in the Pleistocene period there existed at least two very distinct species of mankind.

The discovery at Piltdown gave the death blow to the "linear" theory of man's evolution – the conception that man had reached his modern estate in mind and body by a consecutive series of steps and stages. Until a few years ago, we saw, when we looked into the past, a single file of imaginary ancestors receding backwards in the geologist's scale of time, each more distant member of the file carrying us nearer to an anthropoid stage. The discovery at Piltdown was the final touch needed to scatter the "single file" conception. In my former paper in this magazine I sought to give clear expression to the

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idea that, when we seek to reconstitute in our mind's eye the world of ancestral man, the picture which we form must be based on, not the modern world of man, where a diverse but single species exists, but on the more primitive conditions seen in the world of anthropoid apes—man's nearest living allies. There are now living, in their own jungle districts of Africa and the Far East, three distinct genera of great anthropoid apes – the gorilla, chimpanzee and orang; we know of two extinct kinds – from France and India – which cannot be regarded as ancestral forms of living anthropoids, but collateral forms. At one period there were at least five kinds of great anthropoids, probably many more. If we transfer to primitive man the picture suggested by his anthropoid allies, we have grounds for believing that at one and the same time there was not one species of mankind as at present, but many species and genera. Piltdown man is as different from Neanderthal man as the chimpanzee is from the gorilla; there were at least two species or genera of man living towards the end of the Pliocene and beginning of the Pleistocene periods in Europe.

Dr. Eugene Dubois' discovery of that peculiar humanoid form – Pithecanthropus – in Java some twenty-two years ago, opened the way for a belief in the multiplicity of genera in the world of ancient man. The evidence is now complete that this early human form survived in Java until late Pliocene or early Pleistocene times– the date assigned to Piltdown man. If Pithecanthropus be regarded as a direct ancestor of modern man, then we had to suppose that the human brain had almost doubled its size and complexity during the early part of the Pleistocene period – a rate of growth beyond the possibility of belief. The discovery at Piltdown brings us the positive proof that, as regards volume, one kind of man at least had attained a brain of almost modern size and development by the beginning of the Pleistocene. It is therefore plain that Pithecanthropus is an example – there are many parallel instances in the animal world to-day – of the survival or persistence of a very primitive form of mankind – one which, although surviving to the close of the Pliocene period, represents a form evolved during the geological period which preceded the Pliocene, the Miocene or even an earlier epoch. The outlook of the anthropologist has thus undergone a radical change during the last few years. In place of seeking, as formerly, to arrange all known extinct forms of man in a linear series, he is now endeavouring to discover the various branches in the great tree of man's ancestry – a tree with its roots buried deeply in the geological past, and its branches rising towards the geological present – and to assign each discovered extinct form to its appropriate place in this great ancestral tree.

Neanderthal man, as we have already seen, represents the terminal twigs of a dead branch of man's ancestral tree. What is the position of Piltdown man? Is he also a terminal twig of a dead branch or does his position lie directly on the stem of that branch of which all living races of mankind represent the terminal twigs? Does Piltdown man really represent our ancestor at about the beginning of the Pleistocene period – our ancestor some half-million of years ago? In their communication 4 to the Geological Society Mr. Charles Dawson and Dr. Smith Woodward leave this question unanswered. In his lectures on "Recent Discoveries of Early Man" at the Royal Institution, Dr. Smith Woodward was, however, more definite. In his opinion the Galley Hill and Ipswich skeletons are "now to

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be regarded merely as late burials." It is clear from this statement that Dr. Smith Woodward is of opinion that Piltdown man is our Pleistocene ancestor and that all those remains of men of the living type which have been found in undisturbed strata, laid down during the middle third of the Pleistocene period, are really the bones of comparatively modern individuals, buried in rather ancient strata. A survey of the evidence before the Piltdown discovery had led me to formulate, in these pages, an exactly opposite conclusion, namely, that the discoveries at Galley Hill, near Gravesend, at Bury St. Edmunds, at Ipswich and others. made in France and in Italy, were guarantees that by the middle third of the Pleistocene period, men of the modern type were already evolved. Since then I have again gone over the geological evidence bearing on these human remains, and I see no loophole of escape from the conclusion that these remains are as old as the strata under which they were found.

Any one enquiring into the ancestry of modern man will find the discovery of the Ipswich man in 1911 and the Piltdown man in 1912 very instructive. Both were found beneath shallow deposits – within easy reach of the gravedigger's spade. The skeleton of the Ipswich man lay on a Pleistocene deposit – the mid-Glacial sands, and under an unbroken layer of weathered chalky boulder clay, also a Pleistocene deposit – only 4 feet in thickness. The remains of the Piltdown skull came from an iron-cemented stratum of gravel, only about 6 inches thick, lying beneath a layer of gravel rather less than 4 feet in depth. At Ipswich, as at Piltdown, the remains lay scarcely 5 feet beneath the surface. Why is it, then, that the Ipswich skeleton has been rejected by the vast majority of geologists while the Piltdown remains have been universally accepted as ancient and authentic? The answer is not far to seek. Except as regards his shin bone or tibia, the Ipswich man was like modern man; in every feature of his skull, jaw, and teeth Piltdown man differed from modern man. The peculiar characters of the Piltdown man gives him a free pass to our confidence, but why do we reject the man from Ipswich? Can he not be ancient, even if he is not marked by peculiar characters? My friend, Dr. Ales Hrdlicka, of the Bureau of American Ethnology, has expressed very well the attitude of most geologists and anthropologists to such discoveries as that at Ipswich.

Six years ago he published a most valuable account of the various discoveries of ancient man which had been made in North America. He had made a personal examination of each one of them, and in not a single case was he convinced of their authenticity – chiefly on the score that the human remains thus discovered differed in no material circumstance from those of modern man. I shall cite an instance. In 1902 an adult skeleton was discovered at a depth of 23 feet in a Glacial deposit at Lansing, Kansas. Dr. Frederick Wright, who has given a lifetime to the study of Glacial deposits in North America, regards the Lansing deposit as formed before the last cycle of glaciation and gives its probable antiquity as 12,000 years. If the European cycles of glaciation were contemporaneous with those of North America, then the antiquity, if I may infer from the estimates given by our own geologists, is three or four times greater than that given by Dr. Wright. No one has ever called in question, no one can call in question, that the Lansing skeleton is as old as the deposit under which it lay. Dr. Hrdlicka, however, rejects it on the ground that "this man was physically identical with the Indian of the

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present time," and to accept the skeleton as authentic would involve "the far more difficult conclusion that his physical characteristics during all the thousands of years assumed to have passed have undergone absolutely no important modification." We have here the expression of a belief widely accepted by modern biologists who regard the law of change as so dominant that it is almost impossible for any animal species to come through a whole geological period and remain unchanged. Dr. Smith Woodward assumes the same attitude towards the Galley Hill remains as Dr. Hrdlicka takes towards the Lansing skeleton. The hard case of modern man is thus apparent: he is, in a geological sense, sentenced before he is tried.

Before we can answer the question, Is the Piltdown man our direct ancestor? we must make two preliminary enquiries: When did he live? What sort of person was he or she? If we find in him just those features which foreshadow our own, and if it can be proved that he lived at the same time as the Galley Hill man, then most of us would be inclined to suspect the authenticity of the Galley Hill find – to suspect that in some astute manner Mr. Robert Elliott, Mr. Matthew Heys, Mr. E. T. Newton and Dr. Frank Corner had been tricked. In order to make clear the accepted beliefs regarding the ages of the Galley Hill and Piltdown men I have given a diagrammatic section beginning at the Thames Valley and running southwards through the Weald of Sussex, cutting both the North and South Downs. The diagram is compiled from papers and sections published by Mr. A. C. Hinton and A. S. Kennard ⁶ and by Mr. Charles Dawson, ⁷ the discoverer of Eoanthropus. The Galley Hill skeleton was found in the 100-foot terrace on the south side of the Valley of the Thames at a depth of 8 feet; the bed of gravel in which the Piltdown remains were found lies within the Weald, and occurs at a higher level than the 100-foot terrace of the Thames. The gravel on the Piltdown plateau lies about 120 feet above the datum line of the Ordnance Survey, and, therefore, as regards level, represents an older and higher terrace – the so-called 130-foot terrace – than that in which the Galley Hill skeleton was found. Mr. A. S. Kennard, however – and his opinion must carry weight – regards the Piltdown gravel as of the same age as the 100-foot terrace. Mr. Reginald Smith and Mr. Henry Dewey have recently given us accurate information regarding the cultural ages which are represented in the 100-foot terrace. ⁸

The deeper or older strata were laid down where the natives of the Thames Valley – the bed of the river was then flush with the 100-foot terrace – were working their flints in the pre-Chellean or Strepyan style; in the middle strata come the products of the long Chellean age, and in upper or more recent layers both periods of the Acheulean culture appear. Apparently the 100-foot terrace began to be formed when mankind was in the Strepyan stage of culture, and its formation ended with the Acheulean stage; its strata are mid-Pleistocene as regards geological age. The gravel deposit at Piltdown is a shallow one, but there are two strata in it. In the distinctly-marked bottom stratum were found the remains of Eoanthropus; in the same stratum were found the remains of animals – Stegodon, Mastodon, Hippopotamus – which lived during the Pliocene epoch; remains of a beaver were also found, and it, for aught we know to the contrary, may also be Pliocene in date.

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Indeed, Mr. Lewis Abbott, who knows the recent geology of the Weald as well as any one, has no hesitation in assigning the bottom Eoanthropic stratum to a Pliocene date. Ever since Prestwich's time we have regarded eoliths as the handiwork of Pliocene man; eoliths occur in the bottom stratum; there is, therefore, presumptive evidence that the bottom stratum is Pliocene in date and that Eoanthropus represents a form of Pliocene man. In the opinion of Mr. Dawson and Dr. Smith Woodward, both the bottom and upper strata at Piltdown are early Pleistocene deposits. In the upper or disturbed stratum were found certain worked flints which they regarded as of the Chellean type of workmanship. If the upper bed is of the same age as the deep stratum, and if these flints are really of the Chellean type of workmanship, then Eoanthropus and the Galley Hill man were contemporaneous – both belonging to the middle Pleistocene period.

It is evident, however, that neither Mr. Dawson nor Dr. Smith Woodward place any reliance on these worked flints, for they assign Eoanthropus to an early part of the Pleistocene period – to a time when a much more primitive culture than the Chellean was in existence. Eoanthropus, they think may have been a contemporary of the Heidelberg man. To show how far the Heidelberg man antedates the Chellean period I have reproduced a figure from my former paper in these pages. In M. Rutot's opinion, two long cultural phases intervene between the time of the Heidelberg and Galley Hill men. All the evidence then leads us to suppose that Eoanthropus precedes the Galley Hill man by a long space of time. How long we have no means of forming an exact judgment, but on the rough methods at present in use we are certain that it amounts to many thousands of years. If Eoanthropus was a contemporary of the Mastodon – which he may have been – then he takes his place in the Pliocene, and his date is still further removed from that of the Galley Hill man.

Mr. Charles Dawson not only discovered Eoanthropus; the existence of an early Pleistocene or late Pliocene deposit in the Weald of Sussex was also his revelation. Deposits of an early Pliocene date were known on the uplands of the North Downs, but no geologist had ever guessed that down in the bosom of the Weald there lay deposits which are either late Pliocene or early Pleistocene in date. It was Mr. Dawson that revealed such a formation. No one had made a more systematic examination of the Pleistocene and Pliocene deposits of Western Europe than M. Rutot of the Royal Natural History Museum of Brussels. On hearing of the discovery of Eoanthropus he asked me at what level the Piltdown gravel occurs, and how far it lay above the level of the Sussex Ouse. I replied, 120 feet above sea level, and 80 feet above the Ouse. His answer was: "That deposit is Pliocene in date; it is nearly of the same age as the deposits at St. Prest, on the Eure, near Chartres, France." I immediately became interested in St. Prest.

On consulting a map, which Professor Boyd Dawkins had prepared to show the state of Western Europe in late Pliocene times, I found that the Sussex Ouse and the French Eure were tributaries of the same great river flowing westwards on the site of the English Channel. The deposits at Piltdown and at St. Prest thus lie within a common watershed; in each case, both at Piltdown and St. Prest, the neighbouring river has deepened its channel 80 feet below these old gravel deposits. About the geological position of the

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deposits at St. Prest there has never been any doubt; they are late or upper Pliocene. In April, 1863, M. M. J. Desnoyers, 9 described by Hamy as "le savant bibliothécaire du Muséum," discovered that many of the fossil-bones found even in the deeper strata at St. Prest showed exactly the same markings as bones from Pleistocene caves – markings which were regarded, as far as the cave bones were concerned, as undoubted evidence of man's handiwork. Only the fact that these evidences of man's work occurred in a deposit of Pliocene date prevented Desnoyers' discovery from being universally accepted. Since Desnoyers first announced his discovery worked flints have been found in the St. Prest deposits.

In M. Rutot's opinion the "Prestian" flints are of a later date – a higher type – than the Kentish flints or eoliths found in the bottom stratum at Piltdown with *Eoanthropus*. The fauna at Piltdown is of an older Pliocene complexion than that of St. Prest. Westwards from Piltdown, near the Dorset village of Dewlish, lying also within the watershed of the ancient Channel river, is another piece of evidence which may throw some light on the condition of man towards the end of the Pliocene period. This evidence takes the form of a deep, narrow trench cut in the chalk, 100 feet long, 12 feet in width, which contains the remains of a Pliocene form of elephant (*Elephas meridionalis*), and also flints, which Mr. C. J. Grist 10 regards as of the same workmanship as the Kentish eoliths. The Rev. O. Fisher, 11 who investigated and described this trench in 1888, cannot conceive how it could have been fashioned unless by the hand of man. It is similar to trenches dug by certain native tribes for the capture of elephants. Taking the evidence at Dewlish and St. Prest into account, we seem to have reliable indications of a fairly high type of man at the end of the Pliocene period.

Having thus tried to ascertain all that can be known at present of the age or period of the Piltdown remains – the evidence pointing to a Pliocene rather than a Pleistocene date – we shall now seek to answer as briefly as possible: What kind of person was he or she? We may take the question of sex first. It is often hard enough on the evidence of the skull by itself, to recognise the sex of even a modern person; it is much more difficult, well nigh impossible, to recognise the sex marks in a new type of human being represented by only a fragmentary skull of one individual. Dr. Smith Woodward is inclined to regard the Piltdown skull as that of a woman; the markings, in my opinion, point to the male sex. The head is massive, the mastoid processes are not only well marked but large; the neck was thick, for the mastoid processes which mark the width of the neck, behind and below the ears, are wide apart. Perhaps the safe way, until we get a fuller knowledge of the Piltdown race, is to speak of this individual as "it" rather than "he" or "she."

Early in the month of November, 1912, I had the privilege of seeing the Piltdown fragments for the first time. I was duly impressed with the remarkable thickness of the bones which form the brain chamber of the skull, and their degree of fossilisation, but the feature which seized my attention was the chin; never before had a chin with such characters been seen in a human being – only in apes. The two accompanying figures (Fig. 3) will make this remarkable feature clear. On the hinder aspect of the lower jaw in the region of the chin is a deep pit, from which the chief muscle of the tongue arises—the

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genio-glossus. This pit is bounded below by shelf or plate of bone—we may call it the "simian chin-plate." That plate is present in the Piltdown lower jaw, the upper part of the jaw in the region of the chin is broken away, but we may safely assume that in this region the Piltdown jaw was very similar to that of an ape. In modern man the chief muscle of the tongue no longer arises from a pit but from a bony prominence (Fig. 3). We know what must have happened in the lower jaw of man in passing from a simian to a human stage of evolution, for the Heidelberg mandible (early Pleistocene) shows us an intermediate stage.

In that mandible the pit is nearly filled up with a new growth of bone, forming the prominence from which the chief muscle of the tongue arises. In the filling up of the pit the simian plate seems to disappear; in reality it is included in the prominence from which the tongue muscles arise. In modern man a further change has occurred; the chin is no longer receding but prominent (Fig. 3, A). The prominence of the modern chin is the result of two changes: one of these is the great diminution in the size of the teeth, with the result that the upper or tooth-bearing part of the lower jaw recedes backwards, leaving the chin prominent. The prominence of the chin, however, is also due to another factor – one related to speech. To facilitate speech the floor of the mouth, which is bounded by the lower margin of the jaw, must be widened and opened out, in order that the tongue may be freely elevated and depressed during speech, for the tongue is the chief organ of articulation. I regard all the essential features of the human lower jaw and chin as adaptations to the faculty of speech; I know of no other explanation for man's peculiar chin characters. If my reasoning is right, then the Piltdown man was not adapted for articulate speech; it may be questioned if even the Heidelberg person had this faculty developed to more than a rudimentary degree.

The presence of a simian chin-plate in the Piltdown mandible seems to me to throw some light on the probable period of the race to which it belongs. I could not conceive that the extraordinarily elaborate and complex mechanism which underlies the faculty of speech could have been evolved independently in two or more ancestral races of mankind. One can see that the process of adaptation to speech was already under way in the Heidelberg man early in the Pleistocene period; in the Piltdown mandible that stage has not been reached; the condition is still simian, and I infer that Piltdown should be much earlier than Heidelberg – at least Pliocene in date. It is also possible, as Dr. Smith Woodward suggested, and I was keenly alive to the possibility, that the Piltdown race was a survival from a more ancient time, which had persisted in England when mankind in another part of the world had made some progress in the faculty of speech. If Piltdown man is Pleistocene in date that is the only feasible explanation.

The presence of that simian chin-plate in the Piltdown jaw, together with certain other minor features, led Dr. Smith Woodward to infer that such characters must also be accompanied by a simian dentition – at least, as far as regards the front teeth. When, therefore, he reconstructed the mandible and supplied the missing parts, he gave the Piltdown race massive projecting simian canine teeth – teeth like those of a chimpanzee. It was a perfectly legitimate inference, but there were certain features which seemed to

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me to render the presence of pointed, projecting canine teeth impossible. Projecting canine teeth prevent a free side-to-side movement of the lower jaw in chewing – such as is seen in animals which chew the cud, and also in man during normal mastication. In all animals – man or horse – which have this side-to-side chewing movement, the canines are not prominent, and the jaw is peculiarly jointed to the skull. The articular condyles of the jaw rest in a cavity, the glenoid cavity; as the jaw is carried to the left side, the right articular condyle moves from the cavity on to the articular eminence which forms the front part of the glenoid cavity. That articular eminence is particularly well developed in the Piltdown skull – better even than in modern man. It therefore seemed to me – still seems – that the canine teeth could not have been projecting. In no known mammal are projecting canine teeth accompanied by, or correlated with, an articular eminence.

But it is true, as in Neanderthal man, the articular eminence may be absent and yet projecting canine not be present. Another fact which influenced me was that the two molar teeth, still preserved in the jaw, seemed worn by such a side-to-side movement; a third factor was the relatively small size of the temporal muscle which rises from the side of the skull and acts on the jaw. The extent and size of this muscle can be inferred with some degree of certainty from the markings on the side of the Piltdown skull; the muscle was distinctly smaller than in modern Australian aborigines. A large, prominent canine seems to demand the need of a large temporal muscle; signs of such a muscle are absent in the Piltdown specimen. A fourth character which weighed with me was that in all anthropoids – they have all large projecting canines – the skull is especially firmly hefted to the neck, in order, at least so I infer, that these animals may exercise their ferocious bodily strength through their jaws and great canine teeth. For this reason the mastoid processes of anthropoids do not form downward-projecting knobs, behind the ears, as in modern man, but are thrown outward, as wide bony flanges, to give additional room for the insertion of the strong muscles of the neck. In the Piltdown race the skull was hefted to the neck as in modern man. For all those reasons I concluded that the law of correlation, as propounded by Dr. Smith Woodward, did not hold true, and that the canine of the Piltdown race would be found to be massive but shaped as in modern man.

By the end of the summer of 1913, however, a canine tooth was found in the bottom stratum at Piltdown not far from the spot at which the fragments of the skull were recovered. It was of the type postulated by Dr. Smith Woodward – a pointed simian canine. The tooth was of the right side, it was the corresponding half of the mandible which had been found. In his reconstruction of the jaw, Dr. Smith Woodward had given the canine a "back to front" diameter of 14.5 mm.; I had, in mine, allowed it 10 mm. – 2 or 8 mm. more than in the large modern canine teeth; in the tooth found this diameter was 11 mm. The crown of the canine was deeply worn, but not by attrition against the upper canine, which must have been even more projecting than the lower, but by the upper lateral incisor tooth – a type of wear occasionally seen in the canine teeth of anthropoids. The discovery of this simian-like tooth and part of a simian-like mandible near to each other, and within the same stratum, carries home the conviction to us that they must be parts of one animal, for one cannot suppose that some strange coincidence had brought side by side the canine tooth of a man-like ape and the lower jaw of a man with certain

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ape-like features. But all the same, this lately discovered tooth presents two features which raise a suspicion as to whether or not it does belong to this particular mandible.

Its colour is of a very much darker shade than that of the two molar teeth still in place in the jaw; it also shows signs of long and of hard wear. That is a remarkable fact, because in the Piltdown jaw, although only the socket of the third molar or wisdom tooth is present to bear witness of the fact, we know that the third molar was not completely erupted – had not come into use. The X-ray picture of the jaw demonstrates this fact. Now in all anthropoid jaws the canine and third molar teeth cut or erupt about the same time. We must presume, from the characters of the canine tooth and of the mandible itself, that the canine or third molar teeth should erupt about the same time in the Piltdown race. To me it seems an impossibility that the canine could be worn to such a degree and the third molar tooth not erupted in one and the same mandible. The condition of the third molar gives us the most definite evidence that the Piltdown jaw belonged to an immature individual. The canine tooth, on the other hand, is that of a quite mature, even aged, individual. The case of the third molar or wisdom tooth in man may occur to the reader; its eruption is often delayed in modern man; sometimes it never cuts at all. The delay of the wisdom teeth is a recent feature of man's dentition, for I have failed to find a single instance in either ancient or primitive man in which there was any evidence of the delay or non-eruption of the wisdom tooth. In the Piltdown mandible we are dealing with a very primitive form of human dentition.

Even if the tooth does not belong to this particular mandible we must suppose it belongs to one of the same kind. That a human ancestor should be discovered with projecting ape-like teeth has been anticipated by all who have closely studied the anatomy and development of man's teeth; one cannot account for the peculiar history of our canines unless one supposes they have come through a simian stage. But I expected to find, when that simian stage in our ancestors was discovered, that the other anthropoid accompaniments which are seen in the mandibular joint and in the muscles of mastication, would also persist with the projecting canines. In the Piltdown skull all the features which suggest a human form of mastication are present—those features on which I have already laid stress. There is one way out of this difficulty – that suggested by Sir E. Ray Lankester and urged by Professor Waterson – namely, that the mandible and the skull are parts of different kinds of beings: the mandible that of some unknown anthropoid and the skull that of a primitive form of man. When we seek to get out of our difficulty in this way we raise others. The molar teeth in the Piltdown mandible are essentially human in appearance; the texture of the mandible is similar to that of the skull. The markings for the temporal muscle, which acts on the jaw, are different to any ever seen in a human skull and indicate that the mandible should be of a peculiar character – such as has been found. For my part I am trying to see if it is possible that an articular eminence could exist with projecting canine teeth. Amongst known mammals there is no instance of projecting canines and articular eminences existing together in the same individual. Still, there may have been some peculiar arrangement of the canine teeth which permitted side-to-side movements in the Piltdown race. In the meantime I am proceeding on the assumption that the future will bring forth the evidence which is

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needed to show that the Piltdown combination of characters is possible. The existence of such a combination, however, must not be regarded as proved.

At the celebrated meeting in the Geological Society's rooms on December 18th, 1912, I had no fault to find with the manner in which the Piltdown skull had been restored. When replicas of the cranial fragments were distributed in May, 1913, I had no idea that any criticism could be made on the manner in which the work of restoration had been carried out. My attention was first drawn to Dr. Smith Woodward's reconstruction when I had worked out on a fairly large modern skull, the parts which had been found – in order that visitors to the Surgeons' Museum might realise the position and size of the actual parts on which the reconstruction was based. The skull I worked on had a capacity of 1,450 c.c. – a little below the average capacity for Englishmen, which is about 1,490 c.c. I found that the Piltdown fragments were parts of larger bones than those in the skull on which I worked. The capacity of the Piltdown skull being only 1,070 c.c. – a low capacity, the fragments should have been considerably smaller than the corresponding parts of the modern skull – even when allowance is made for the fact that the thickness of the Piltdown bones is nearly twice that which obtains in modern skulls. On searching for an explanation of this discrepancy, I found that there was a great degree of asymmetry in the restored skull – that the left and right halves did not match. In the brain cast the right and left halves were markedly unlike. Instead of measuring only 1,070 c.c. as had been announced, the brain cast displaced almost 1,200 c.c. of water. The left half in its posterior part was 90 c.c. greater than the right.

Now in all primitive forms – in anthropoids and primitive races of men – the right and left halves of the skull and brain are approximately symmetrical in size and form; symmetry is a primitive character therefore to be expected in an early type of man. In searching for the cause of the asymmetry I found that it was chiefly due to a wrong articulation of parts. It may be urged against me that in a new form of being, such as that we are now dealing with, the laws which hold good for modern human skulls may not be fully applicable. That cannot be put forward as a valid reason, for Dr. Smith Woodward announced that he could detect no marked difference, except as regards thickness, between the Piltdown and modern cranial bones. With that opinion I do not agree; every one of the Piltdown cranial bones has distinctive characters – characters which mark them off from the same bones of modern man. But they are of a truly human shape, and, therefore, in putting the parts together, we must proceed in the task of restoration exactly as we would if the corresponding parts of a modern skull were before us. When the parts are articulated, so that each structural point occupies its normal anatomical position, the asymmetry of the restored skull disappears to a large extent, and the capacity of the skull becomes, not 1,200 c.c., but 1,600 c.c., that amount being rather above the modern average. The Piltdown skull is in reality massive. There are several methods in which one can proceed in the act of reconstruction; I checked one method against another, and found that in each experiment – by employing a totally different procedure – the result came out the same in each case.

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The results of a long and close investigation of the Piltdown skull has led me to the following conclusions: – (1) that the remains found at Piltdown represent a form of man living in the later part of the Pliocene period; (2) that he had a massive skull, differing from modern skulls in many structural characters; (3) that the brain was as large as in the average of modern races; (4) that the jaws and teeth were more anthropoid than human in character; (5) that, although the brain is large, I cannot believe that speech was possible with such a conformation of jaw and tongue; (6) that, on the whole, the evidence is in favour of the mandible and skull being parts of one individual, but that the canine tooth belongs to another individual of the same race.

As regards the final question, Have we found at Piltdown an ancestor of the modern races of mankind? my answer is in the negative; Piltdown man is apparently not our ancestor. The facts on which the solution of the problem has to be based are few and fragmentary; we have to frame our explanation to account for such facts as we have now at our disposal. We have, in the first place, the early Pleistocene Heidelberg jaw; that tells us for certain that a man of the Neanderthal type was in existence at that time – Neanderthal man with great brow ridges similar to those of the chimpanzee and gorilla. So closely are these two anthropoids allied to man structurally that we must suppose the gorilla, the chimpanzee, Neanderthal man, Piltdown man, and modern man – to have a common origin – a common ancestor. It is unlikely that those peculiar eyebrow ridges arose independently in each genus. We may set it down for certain that simian eyebrow ridges were a character of the common ancestor from which all human races, human species and human genera have arisen.

Neanderthal man has retained them; Piltdown man and modern man have lost them. We must also presume that the simian chin-plate is a common inheritance – a character of man's common ancestor. In Piltdown man this plate has been retained as in the gorilla and chimpanzee; in Neanderthal man, as in modern man, it has been lost. We must presume, then, to account for certain facts, that the common ancestor of human races possessed simian eyebrow ridges and a simian chin-plate. From that common ancestry springs one form, in which the eyebrow ridges were dominant and persisted, but the chin-plate was recessive and disappeared, the combination found in Neanderthal man. In another form, the eyebrow ridges were recessive, but the chin-plate was dominant, the combination found in Piltdown man. We may presume, independently of corroborative facts – the discoveries of remains of the modern type of man, at Castenedolo (Italian Pliocene), at Olmo (Italian early Pleistocene), at Galley Hill (mid-Pleistocene) – that there was a third form evolved at the same time as the other two, one in which both eyebrow ridges and chin-plate were recessive. This third form would give us the ancestry of modern races of men. Far from proving, as Dr. Smith Woodward evidently thought, that the modern type of man could not have existed at the time the 100-foot terrace of the Thames valley was deposited, the discovery at Piltdown has furnished us with the strongest evidence in favour of his early, probably Pliocene, evolution.

The Significance of the Discovery at Piltdown

Footnotes

1 Bedrock, October, 1912, Vol. I., p. 295.

2 Quarterly Journal of Science, 1864, Vol. 1, p. 88.

3 Natural History Review, 1864, Vol. 4, p. 429.

4 Quarterly Journal of the Geological Society, 1913, Vol. 69 (March), p. 117.

5 "Skeletal Remains suggesting or attributed to Early Man in North America," Smithsonian Institution, Bulletin 33, 1907.

6 "The Relative Ages of the Stone Implements of the Lower Thames Valley." Proc. Geol. Assoc., 1906, Vol. 19, p. 76.

7 Quarterly Journ. Geol. Soc., 1913, Vol. 69, p. 117.

8 "Stratification at Swanscombe," Archæologia, 1913, Vol. 64, p. 177.

9 Compt Rendu. Acad. des Sc., 1863, Vol. 56, pp. 1073, 1199.

10 Journ. Roy. Anthropol. Instit., 1910, Vol. 40, p. 192.

11 Quart. Journ. of Geol., 1888, Vol. 44, p. 819; 1905, Vol. 61, p. 35; Nature, 1913, Vol. 92, pp. 6 et seq.